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REPORT ON POLLUTION OF THE WATERS OF THE STATE



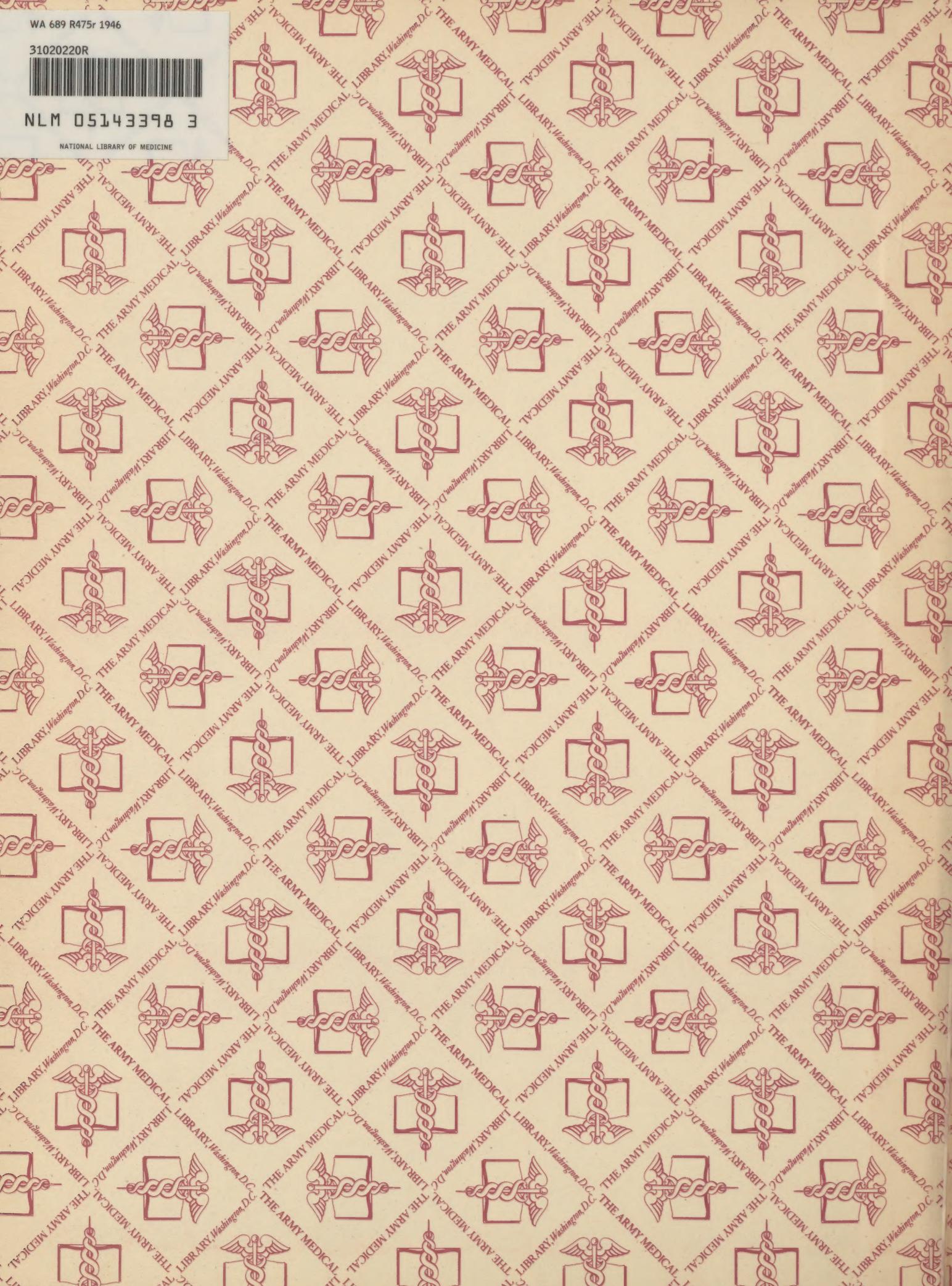
Rhode Island State Department of Health

December 23, 1946



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REPORT TO
HIS EXCELLENCY JOHN O. PASTORE
Governor of Rhode Island

On

POLLUTION OF THE WATERS OF THE STATE

Rhode Island.

"Division of Sanitary Engineering, Rhode Island Department of Health, December 23, 1946

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ВЫСТАВКА В МИАНЕ ВСЕХ СИСТЕМ

БЫЛА ПРОДОЛЖЕНА ДО 10 ИЮНЯ.

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December 23, 1946

Honorable John O. Pastore
Governor of Rhode Island
State House
Providence, Rhode Island

Sir:

I have the honor to present herewith a report on "The Pollution of the Waters of the State" which was prepared by the Acting Chief of the Division of Sanitary Engineering in accordance with your direction.

Respectfully yours,

Edward A. McLaughlin M. D.

Edward A. McLaughlin, M. D.
Director of Health

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REPORT ON THE POLLUTION

OF THE

WATERS OF THE STATE

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REPORT ON THE POLLUTION OF THE WATERS OF THE STATE

INTRODUCTION

The report which follows was prepared at the direction of His Excellency, John O. Pastore, Governor of Rhode Island, to provide him with the recommendations of the Division of Sanitary Engineering relative to a pollution control program for Rhode Island which will meet present needs, be adapted to future needs, and which can be carried out with a minimum expenditure of public and private funds. The writer has reviewed a large volume of information gathered over the years since enactment of the pollution control statute in 1920. This information includes not only the results of analyses of water and the reports of employees of the state concerning the sources of pollution, but numerous reports of firms of consulting sanitary engineers, of established reputation, who have investigated and made recommendations relative to various phases of the problem. It is with this background added to the writer's long experience in pollution control work in Rhode Island that this analysis of the situation and the recommendations contained herein are presented.

No attempt was made to submit a detailed analysis of each of the waters of the state. Such information has been published in the annual reports of the Board of Purification of Waters and the annual reports of the agencies which succeeded the board, the Division of Purification of Waters and the Division of Sanitary Engineering. It is also contained in special reports of these agencies and is available in large volume in the files of the Division of Sanitary Engineering. The purpose of the report is twofold; to show by means of diagrammatic maps the

condition of the waters of the state at the present time and a planned condition which should result from a program of pollution abatement which is comprehensive yet realistic; to offer a means of accomplishing the desired improvements in the most economical manner.

EXPLANATION OF MAPS

Appended to the report are three maps. On Map I the present condition and usefulness of the tidal waters of the state are shown. On Map II the planned condition and usefulness of the tidal waters of the state are indicated. On each of these maps, the water areas are colored to show the classification into which they fall. Map III shows the present and planned condition of the inland streams. On Map III, present condition is indicated by a ribbon of color on the left bank of the stream, and planned condition by a ribbon of color on the right bank of the stream. In any instance where the planned condition will remain the same as the present condition, the right bank of the stream is left uncolored. This was done to make the map easier to read. Outlines of watersheds of streams are shown by a heavy black line.

Classification According to Highest Use

Class A—Waters shown in green are used or are suitable for use as drinking water supply or for the cultivation of market shellfish.

Class B—Waters shown in blue are used or are suitable for bathing.

Class C—Waters shown in yellow are used or are suitable for use for recreational boating, fishing, culture of seed oysters, or industrial supply after treatment.

Class D—Waters shown in red are used or are suitable for use primarily for commercial navigation or transportation of wastes without nuisance.

Class E—Waters shown in red violet are grossly polluted and cause a nuisance. This class has no place in a planned condition.

Basis of Planned Condition

In planning the future condition of the waters of the state, ideal conditions must in some cases give way to conditions which are less ideal but which are practically obtainable in a state such as Rhode Island which is highly industrialized, densely populated, and enjoys considerable sea commerce. Present day essential uses will not permit the return of all the waters of the state to the condition they were in when Rhode Island was an undeveloped area. The planned condition of the waters of the state indicated on the accompanying maps are the highest classifications compatible with the conditions found in Rhode Island. The availability of water for dilution, the fact that some of the sewer systems in use are of the combined type (carry both storm water and sanitary sewage), and the limitations of accepted methods of sewage and industrial waste treatment have been taken into consideration. In no case does the planned condition of the waters of the state admit of offensive conditions.

UPPER NARRAGANSETT BAY, PROVIDENCE RIVER AND TRIBUTARIES

It is the considered view of the writer that the most vital and pressing pollution problem facing the state today is that involving the waters of Upper Narragansett Bay, the Providence River, and the rivers which empty into these waters. The tributaries of the Providence River which pass through the center of the City of Providence, the Moshassuck, Woonasquatucket, and the Seekonk Rivers, are badly polluted and cause a serious nuisance in the city. They empty into the already polluted Providence River which transports its own pollution and the added pollution into Upper Narragansett Bay. Nowhere in the state is the damage done by pollution so extensive as in these waters. Riparian owners suffer losses in property value, the shellfish industry must abandon the most favorable growing areas, and large numbers of people are deprived of recreational opportunities.

It is only logical then that in any pollution abatement program the improvement of Upper Narragansett Bay and its tributaries should receive prior consideration.

SOURCES OF POLLUTION—UPPER NARRAGANSETT BAY, PROVIDENCE RIVER AND TRIBUTARIES

The sources of this pollution of Upper Narragansett Bay, Providence River and tributaries are principally as follows: the inadequately treated sewage of the City of Providence and the Town of East Providence emptied into the Providence River; partially treated industrial wastes from Saylesville, untreated industrial wastes from Pawtucket and poorly treated sewage from the westerly part of the City of Central Falls all emptied into the Moshassuck River; untreated industrial wastes emptied into the Seekonk River from the Phillipsdale section of East Providence; raw sewage from about two-thirds of Pawtucket and one-half of Central Falls, also large volumes of untreated industrial wastes from these cities emptied into the Blackstone River; untreated industrial wastes in the City of Woonsocket emptied into the Blackstone River; untreated and partly treated industrial wastes emptied into the lower part of the Woonasquatucket River; poorly treated sewage from the state institutions at Howard and from the City of Cranston sewage treatment works emptied into the Pawtuxet River. Examinations of the Blackstone River made over a long period of years indicate that the pollution that river receives in passing through the State of Massachusetts has largely disappeared when the river reaches Rhode Island. Its condition on reaching Rhode Island is not such that it prevents a solution of the problem within the state.

METROPOLITAN SYSTEM

The Metropolitan Sewer Commission Report of December 1933 recommended the creation of a metropolitan sewer district, served by a single sewage

treatment plant, to deal with pollution in the metropolitan area. The project recommended by the commission provided for the collection of all the sewage and industrial wastes in the Blackstone Valley as far north as Woonsocket, with the exception of that treated by the sewage disposal plant of the City of Woonsocket, all the sewage and industrial wastes in the Moshassuck Valley, the Woonasquatucket Valley and the Pawtuxet Valley, and the sewage of the City of Providence and the conveyance of the collected sewage and industrial wastes by means of trunk sewers and pumping stations to a treatment plant at Prudence Island. The treated sewage would be discharged into deep water off Prudence Island. The construction of a trunk sewer on the east side of the bay to collect the sewage of East Providence, Barrington, Warren and Bristol would be deferred to a later date. In the meantime, a small treatment plant would be built to serve the Town of Bristol and improvement would be made in the Warren plant.

The proposed scheme was immoderately expensive at the time the report was made. It was estimated in 1933 that it would cost \$14,850,000 exclusive of the lateral sewers which would have to be installed at an estimated cost of \$4,800,000. Even these high costs did not take into consideration damages which would be incurred through water diversion and if experience in other places is taken into consideration, the estimated costs would be greatly exceeded. Present day sewerage construction costs are said to be 111.6% above what they were in 1933 when the estimate was made.

In addition to high costs, there are fundamental objections to the elaborate project proposed by the commission. While emptying the sewage of the district off Prudence Island in deep water has the advantage of the availability of a large volume of clean water for dilution, such a proposal is a threat to the purity of waters which are now Class A. Imperfect treatment or lapses in treatment (both

of these are normal occurrences) would contaminate clean waters and restrict their use for the cultivation of market shellfish. A program for pollution abatement should not transfer pollution from one area to another. Any scheme to transport sewage from the northern part of the state to a point as far down Narragansett Bay as Prudence Island involves some forty miles of main trunk sewer, several huge pumping stations and many miles of sub-main sewer construction. The millions of dollars invested in such construction accomplish no purification of the sewage, but only its transfer from one location to another. In fact, sewage which has traveled long distances confined in a sewer becomes septic and is much more difficult to treat than fresh sewage. Of the utmost importance is the fact that by collecting sewage in a pipe and conveying it forty miles, no advantage is taken of the enormous natural purification that occurs in a stream in traveling such a distance. The absorption of oxygen from the atmosphere and from plant life, the sedimentation of suspended matter, the action of bacteria and other organisms work profound changes in polluting material which has been dumped into a stream. In the course of one day's flow, a large stream of average velocity will absorb from the atmosphere up to 50% of any oxygen deficiency prevailing at the start of the day's flow. Flow over dams or rapids increases greatly the amount of oxygen absorbed.

The carrying out now of a metropolitan sewerage project as proposed in 1933 would not only cause the abandonment of certain municipal sewage treatment facilities constructed before 1933 at considerable expense, but also facilities constructed since. The latter include over a million dollars worth of improvements at the Providence plant, the Cranston treatment works constructed at a cost of \$600,000 and the West Warwick treatment plant built at a cost of \$170,000. Because of all the foregoing reasons, it is not recommended that the proposal made by the Metropolitan Sewer Commission be adopted.

BLACKSTONE VALLEY DISTRICT SEWER SYSTEM

In general, economy and efficiency of operation are gained by the construction of a single sewage treatment plant to serve several communities rather than by the construction of several treatment plants, provided the sewage of the several communities originates in the same or adjoining watersheds and does not have to be carried long distances to reach a central point for treatment and discharge. An opportunity to obtain such advantages presents itself in the Blackstone Valley. A sewer district established to include the communities and industries in the lower Blackstone and Moshassuck Valleys, and served by a treatment plant located in the northern part of the Town of East Providence on the east bank of the Seekonk River, is undoubtedly the soundest method of dealing with this area.

In the immediate future a trunk sewer should be laid along the Blackstone River, extending from the northerly part of the City of Central Falls, southerly to the district treatment plant located in the northerly part of East Providence. This trunk sewer would intercept the sewage and industrial wastes from the Cities of Pawtucket and Central Falls now emptied raw into the Blackstone River. It should be of sufficient capacity to take the sewage of the villages of Valley Falls and Lonsdale in the Town of Cumberland and sewage and industrial wastes from that part of the village of Lonsdale located in the Town of Lincoln. It would also be advisable to provide the relatively small extra capacity to permit further extension up the Blackstone River to serve the more northerly villages as far as Manville some time in the future. Until the villages of Valley Falls and Lonsdale and the more northerly ones install sewer systems the northerly termination of the trunk sewer would be in the City of Central Falls. The consulting engineers engaged to advise the Town of Cumberland stated in their 1925 report that the plan of sewerage recommended to the town was such that the sewage

could be expected to drain by gravity into a Blackstone Valley trunk sewer.

The district system would take the domestic sewage and industrial wastes discharged into the Seekonk River from the Phillipsdale section of the Town of East Providence. Any plan which fails to provide treatment for the large volumes of industrial wastes of a high pollutational value which are emptied into the Seekonk River at Phillipsdale will not succeed in accomplishing the desired reduction of the pollution load in that river.

The sanitary sewage and industrial wastes of the cities of Pawtucket and Central Falls which have their origin within the watershed of the Moshassuck River would be pumped over the ridge to the Blackstone River watershed and be taken into the district system. This would divert from the Providence system the sewage discharged into that system by Pawtucket. It would also bring about the abandonment of the Central Falls-Moshassuck Valley treatment plant which is of too small capacity for present sewage flow; this plant is in an advanced state of disrepair and has only a negligible salvage value. The industrial wastes of the Sayles Finishing Company would not be taken into the system but would be treated by facilities developed by the Sayles Company. Existing treatment facilities at the Sayles plant must be greatly expanded and improved, however, to provide the degree of treatment necessary to maintain the Moshassuck River to an inoffensive condition. It appears advisable to exclude the Sayles waste from the district system because the entire flow of the Moshassuck River is used in industrial processing by the Sayles plant during the summer months, and returned to the river as waste of high pollution value. If this waste were to be taken into a sewer system, the Moshassuck River would be practically dried up for some distance below the plant and the diversion of water involved might entail serious damage to riparian owners downstream.

It is impossible to give a reliable estimate of the cost of carrying out the

construction of a Blackstone Valley district sewer system and treatment plant as outlined for immediate construction until a more detailed engineering study has been made. However, on the basis of estimates made in the past by engineers on the cost of a treatment plant, trunk sewers and pumping stations serving such an area, and applying an additional 111% to these estimates to provide for current high construction costs, it is estimated that the project would cost approximately \$4,000,000.

OTHER ESSENTIAL IMPROVEMENTS OF UPPER NARRAGANSETT BAY, PROVIDENCE RIVER AND TRIBUTARIES

Woonsocket

Large volumes of industrial wastes now enter the Blackstone River in Woonsocket without treatment. These wastes must be treated to reduce the pollution load now imposed on the river at and below Woonsocket. Unless the wastes in question damage the sewer system, they should be taken into it. If they are such that they damage the system, they should receive preliminary treatment at the industrial plant where they originate and then be taken into the sewer system. This program will require the expansion of the Woonsocket treatment plant and possibly a modification of the treatment method.

East Providence

The existing treatment plant which serves the sewered portion of East Providence requires expansion, improvement, and the addition of secondary treatment facilities to provide a higher degree of treatment. While it may be argued that the volume of sewage discharged from this plant is small (about .5 m.g.d.) when compared with other communities, the waters into which the effluent is discharged require a high degree of purification for all wastes they receive.

Providence

The sewage treatment plant located at Fields Point serves, in addition to the City of Providence, the Town of North Providence and about one-third of the City of Pawtucket. This plant was converted in 1936 from a chemical precipitation plant into an activated sludge plant. Unfortunately, the purification accomplished by the new process, is not what was expected. Ten analyses of the sewage made by the state department of health during the year 1946 show that, on the average, treatment reduces the bio-chemical oxygen demand of the sewage only 43%, producing an effluent which has the relatively high bio-chemical oxygen demand of 110 parts per million. Normally, the activated sludge treatment process is expected to remove from 85% to 95% of the bio-chemical oxygen demand. During the same period, the removal of suspended solids was 52.5% as against an expected removal of 85% to 95%. The sewage effluent shows a high concentration of coliform bacteria ranging from 100,000 to 1,000,000 per 10 ml. It should be kept in mind that (on the average) 46 million gallons per day, the sewage of a population of approximately 275,000 representing about 60% of the sewered population of the state, is emptied into the Providence River at Fields Point. From these facts it is concluded that despite the sewage treatment facilities in operation at Providence, that city is a major contributor of pollution to the Providence River and Upper Narragansett Bay. Purification of the city's sewage must be greatly improved, and disinfection of the effluent from the treatment plant practiced if pollution of the Providence River and Upper Narragansett Bay is to be stopped.

Pawtuxet River

The polluted condition of the Pawtuxet River as it flows into the Providence River is of importance also in considering the elimination of pollution in Upper Narragansett Bay. At the present time there are three major potential sources of pollution of this river.

The sewage of the Town of West Warwick is emptied into it after treatment in the activated sludge plant operated by the town. On the whole, this treatment works is producing a satisfactory effluent although disinfection of the sewage should be carried on the year round instead of on a seasonal basis.

The sewage from most of the state institutions at Howard is emptied into the Pawtuxet River with little or no treatment. A treatment plant which was partly constructed before the war has not been completed. The flow of sewage from those institutions which are connected to the main sewer system is estimated to be nearly 500,000 gallons per day. This is a considerable volume of sewage and contributes substantially to the pollution of the Pawtuxet River.

The City of Cranston Sewage Treatment Works is not producing a satisfactory effluent due to interference of industrial wastes with the sewage treatment process. The city has engaged a firm of consulting engineers to recommend means of overcoming the difficulties encountered and awaits their report. Until a satisfactory effluent is produced at this plant, the lower reaches of the Pawtuxet River will continue to be polluted and contribute pollution to the Providence River.

OTHER AREAS OF POLLUTION

This report has dealt largely with pollution of the waters of the Providence River and Upper Narragansett Bay and the tributaries of these waters because it is felt that the most critical pollution problem exists there, and because abatement of this pollution requires joint action on a drainage district basis as well as individual action by municipalities and industries. There exist in a number of other localities throughout the state isolated areas of pollution which demand remedial action. Such pollution has no influence on the Providence River-Upper Narragansett Bay situation. An examination of the maps attached to this report will show where these polluted areas are located. Some of the more important

ones are; the Branch River, the Pawcatuck River in Westerly, Newport Harbor and Mount Hope Bay. Mount Hope Bay is polluted exclusively by sewage from the State of Massachusetts. Its improvement must await action by that state. It is felt that with the exception of Mount Hope Bay, the existing pollution law can be applied with satisfactory results to these local areas of pollution.

OIL POLLUTION

Opportunities for the escape of oil into the waters of the state are ever present in a port such as Providence where enormous volumes of oil are transferred daily from ship to shore and again handled at installations near the shore. The escape of heavy oil is particularly damaging to shore property, yachts and wildlife.

The escape of oil into the waters of the state may be caused either by mechanical failure or by human failure. In the first case, preventive measures should be directed toward the elimination or alteration of oil handling equipment which is likely to fail and to establish other safeguards in case of failure. Since no mechanical apparatus is foolproof, it can be hoped only to reduce mechanical failures to a minimum. In the case of human failure, only constant vigilance on the part of those handling oil and frequent policing by the state to insure this vigilance can be expected to minimize this expectancy. To pursue both of these aims thoroughly will require more personnel than is now engaged in this work. The strengthening of the pollution law to permit the immediate arrest and prosecution of any individual who through negligence is found causing oil to be discharged into the waters of the state is needed. Present authority providing for a hearing after thirty days notice before prosecution is attempted cannot be practically applied to personnel of ships which are in this port for only a day or two.

CONCLUSIONS AND RECOMMENDATIONS

1. The latest studies of the waters of the state made by the Division of Sanitary Engineering, Rhode Island Department of Health, indicate that with population growth and increased industrial activity, pollution has reached farther down Narragansett Bay than ever, causing extensive damage to natural resources.

2. The war years prevented the taking of remedial measures because of governmental restrictions on the use of scarce materials for such work. This has magnified the problem to a degree which makes immediate action to abate pollution an urgent necessity.

3. A program of pollution control is outlined in this report, one of the main features of which is the creation of a Blackstone Valley District Sewer Commission to provide for the treatment, in a single plant, of the sewage and industrial wastes which originate in several communities and industries located in that valley and the Moshassuck Valley and which is now discharged into the waters of the state either without treatment or with negligible treatment. Legislation should be enacted creating such a state commission with authority to do the following:

- a. Borrow money backed by the credit of the state to finance the planning and construction of the work.
- b. Engage consulting engineers to prepare detailed plans of trunk sewers, pumping stations and a sewage disposal plant consisting of primary treatment and disinfection (secondary treatment to await the results of experimental treatment studies of the mixed sewage and waste) to serve the areas described in this report under "Blackstone Valley Sewer District."
- c. Condemn and take property needed for such sewerage purposes.
- d. Operate the constructed project.

- e. Make the project self-liquidating by assessing equitable service charges annually on each of the municipalities whose sewer system is connected and also on any industry which has a separate connection.
- f. Make connection to the district system of each municipality or industry within the district, as described, mandatory.

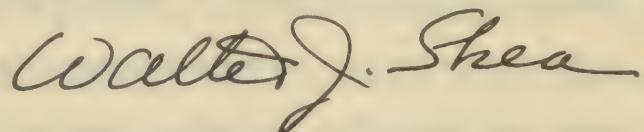
4. A law should be enacted permitting any municipality to assess annual sewer service charges on all properties connected to its sewer system, to meet the costs of sewage treatment. Such a charge in use elsewhere varies from ten to fifteen dollars per property connected.

5. Where pollution exists which may be successfully and economically abated without the creation of a sewerage district including more than one municipality, Chapter 634 of the General Laws of 1938 should be enforced. Specific exemptions granted to Newport, Jamestown and New Shoreham under the law should be removed.

6. Chapter 634 of the General Laws of 1938 should be strengthened to provide for better control of oil pollution.

7. The State of Rhode Island should join with the other New England states in compacts to control pollution of interstate waters and thus control pollution coming from without the state.

Respectfully submitted,



Walter J. Shea, *Acting Chief*
Division of Sanitary Engineering
Rhode Island Department of Health

MAP I

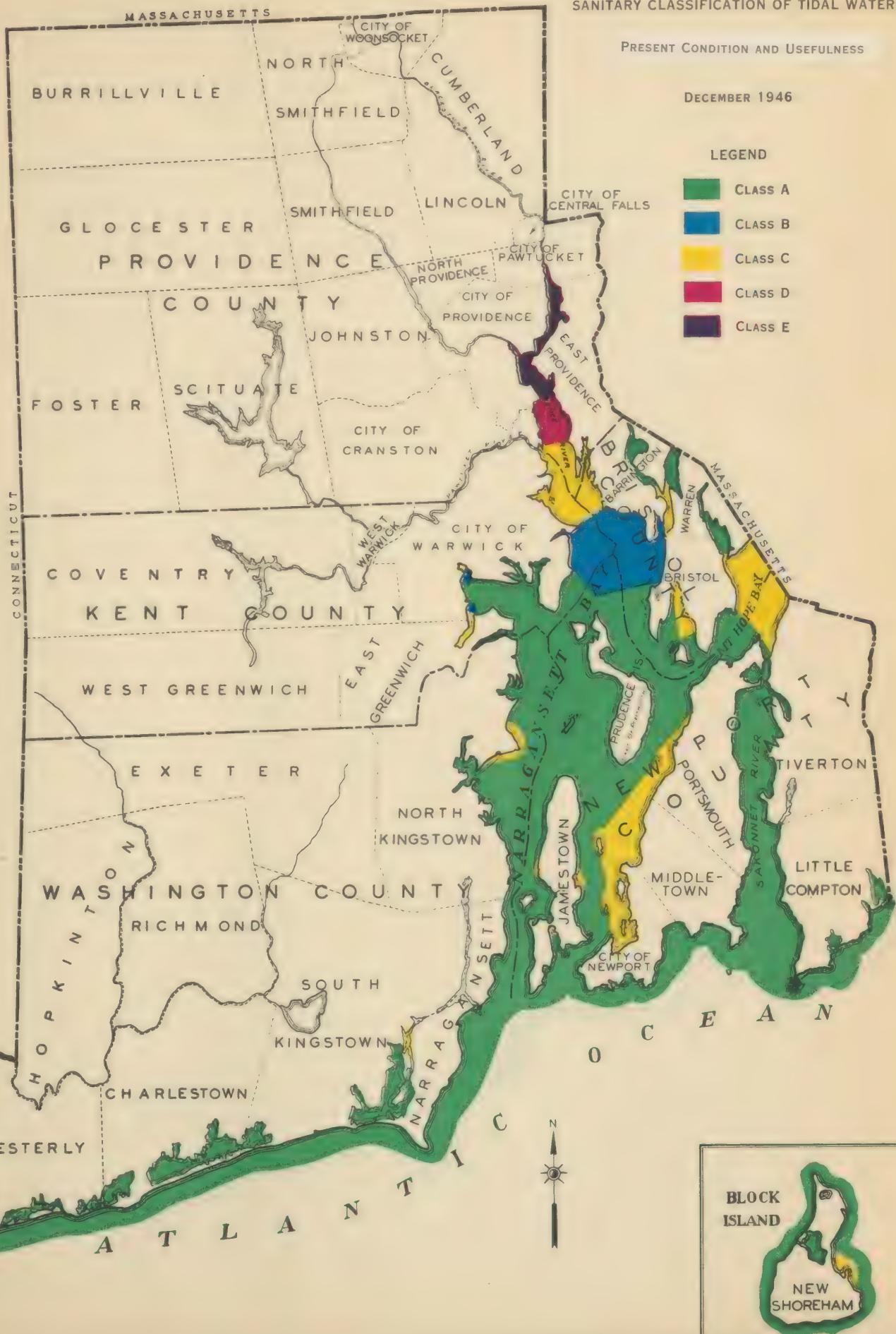
SANITARY CLASSIFICATION OF TIDAL WATERS

PRESENT CONDITION AND USEFULNESS

DECEMBER 1946

LEGEND

- CLASS A
- CLASS B
- CLASS C
- CLASS D
- CLASS E



RHODE ISLAND DEPARTMENT OF HEALTH
DIVISION OF SANITARY ENGINEERING

MAP II

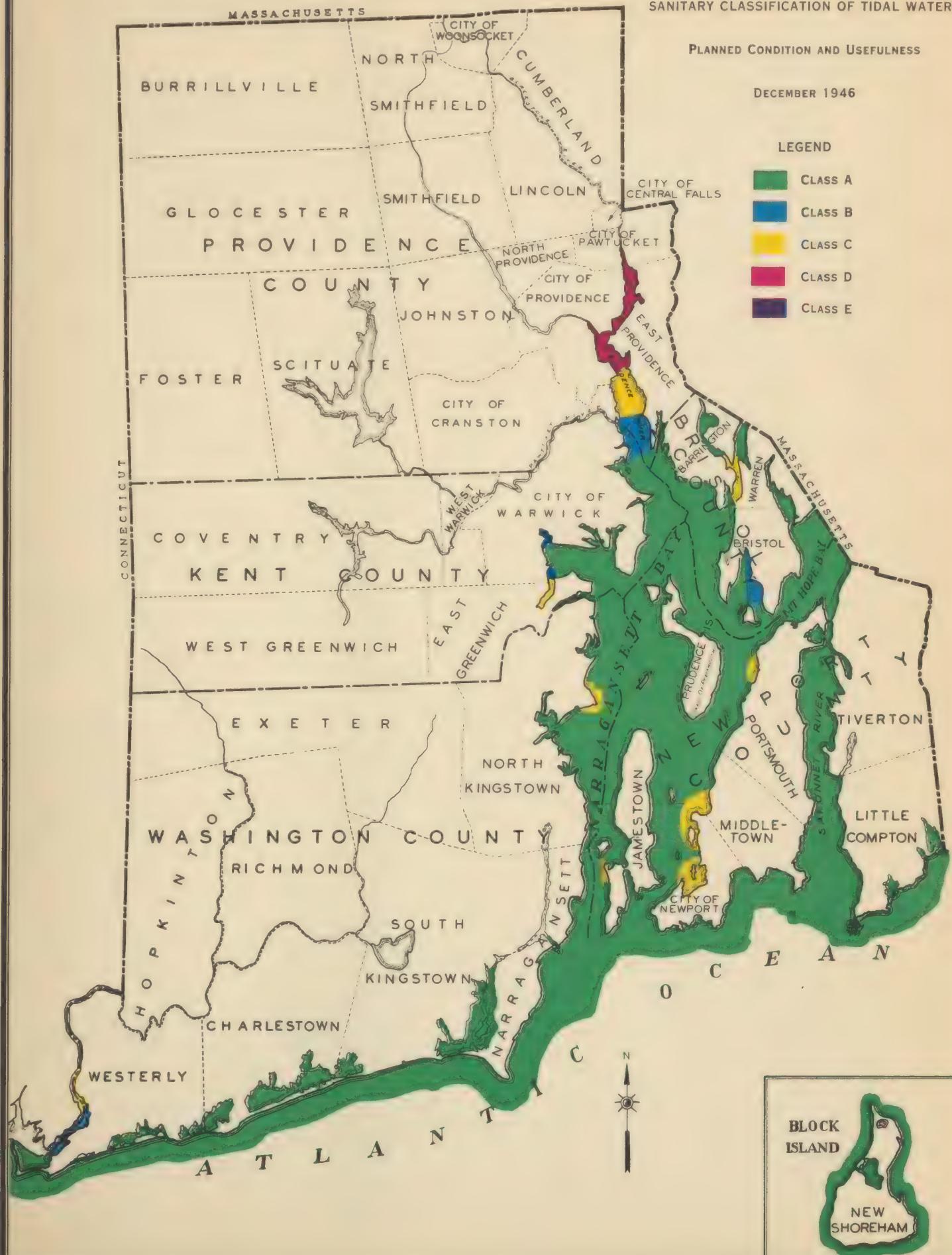
SANITARY CLASSIFICATION OF TIDAL WATERS

PLANNED CONDITION AND USEFULNESS

DECEMBER 1946

LEGEND

-  CLASS A
-  CLASS B
-  CLASS C
-  CLASS D
-  CLASS E



SANITARY CLASSIFICATION OF STREAMS

PRESENT CONDITION AND USEFULNESS - LEFT BANK

PLANNED CONDITION AND USEFULNESS - RIGHT BANK

DECEMBER 1946

LEGEND

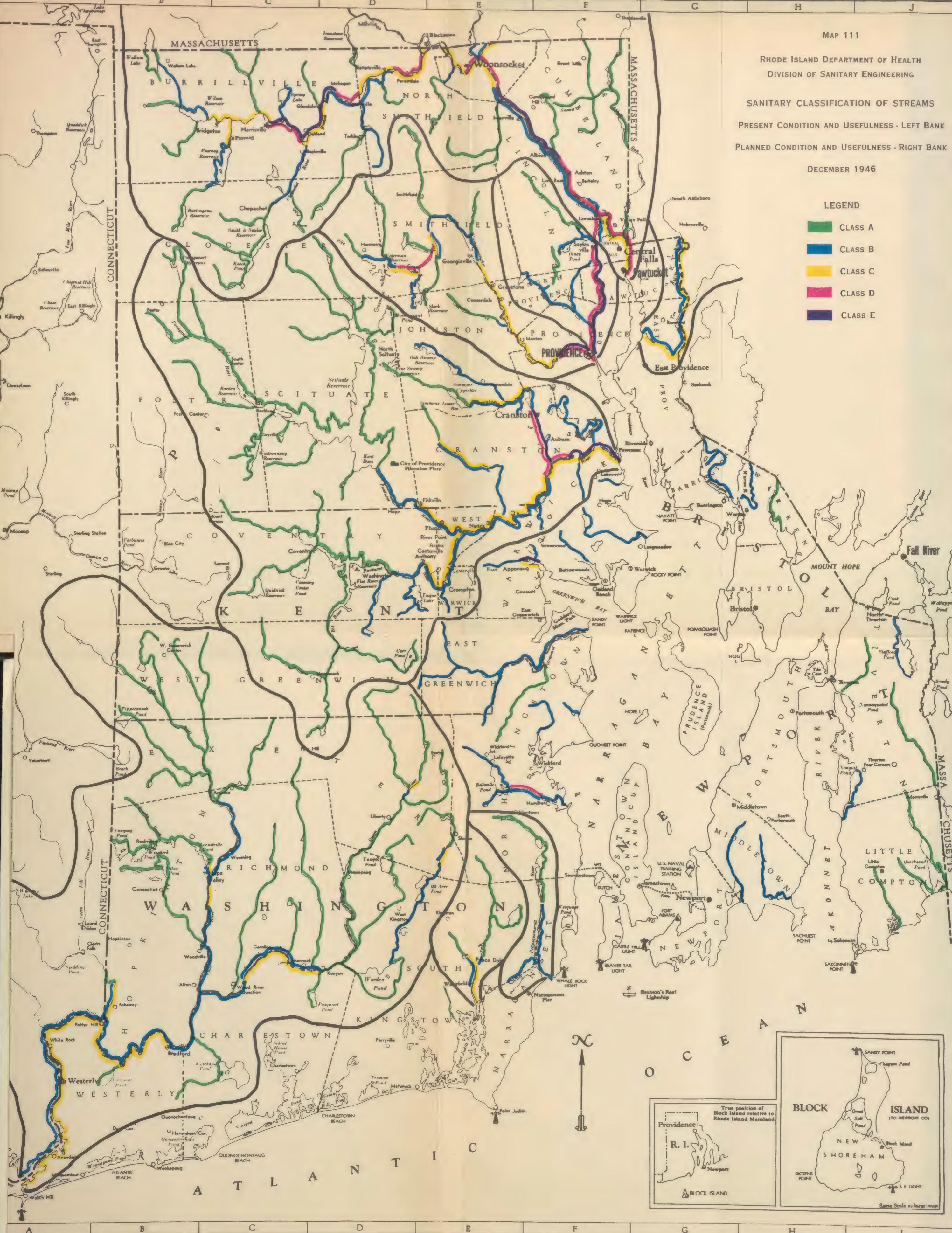
CLASS A

CLASS B

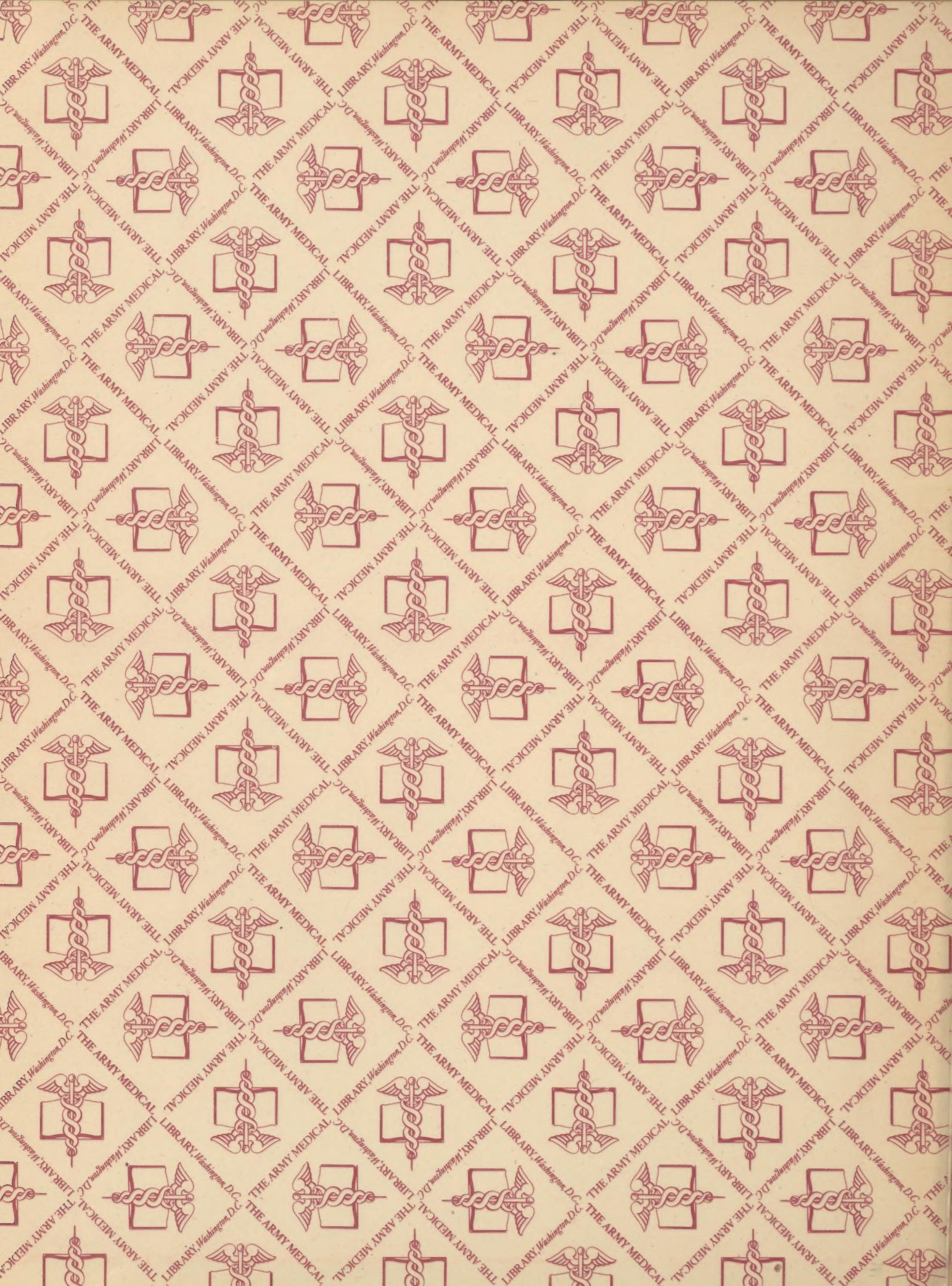
CLASS C

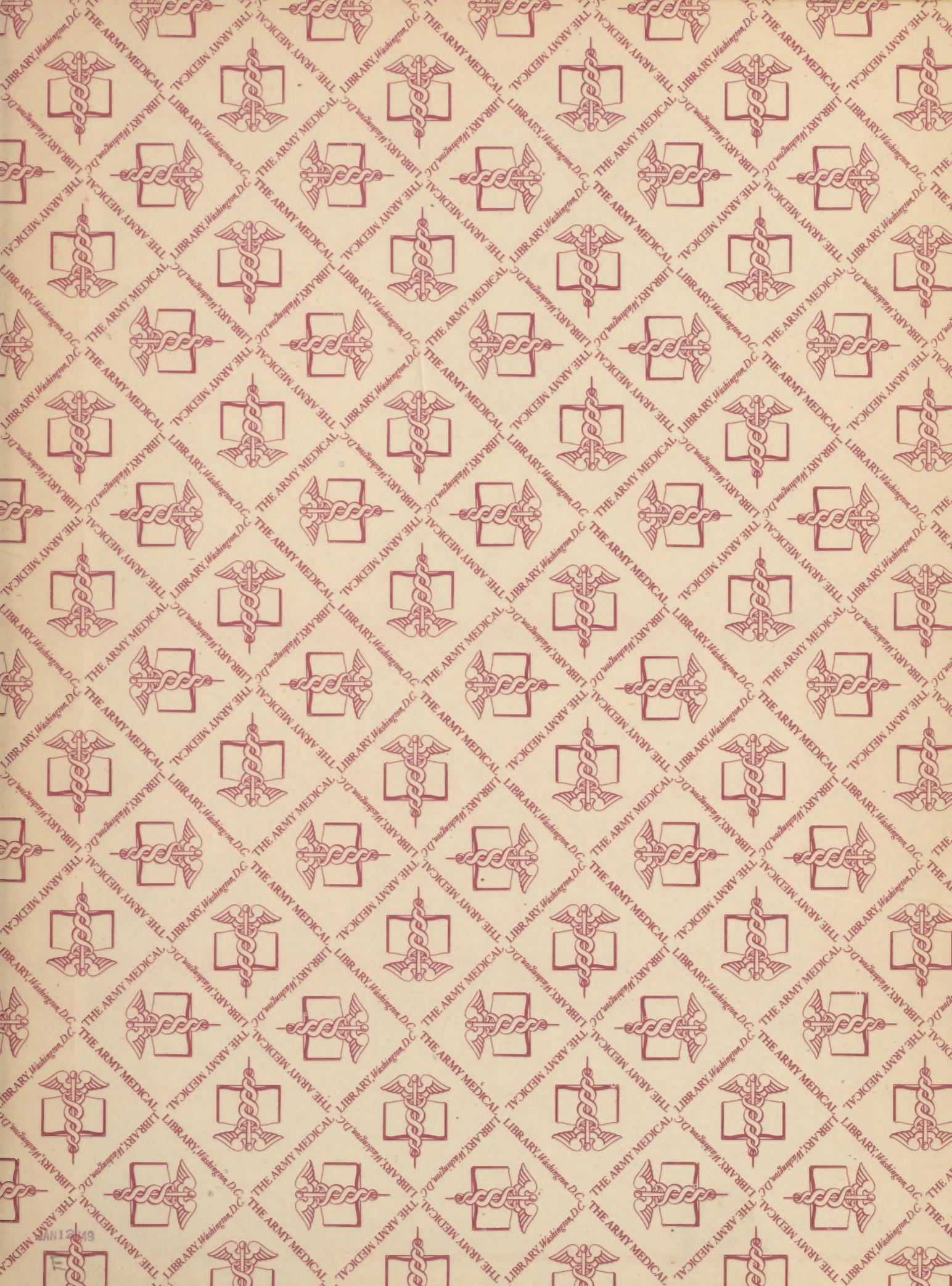
CLASS D

CLASS E



Notes





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